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U.S. – CHINA ECONOMIC AND SECURITY
REVIEW COMMISSION

DEPARTMENT OF THE AIR FORCE

PRESENTATION TO THE
U.S. – CHINA ECONOMIC AND SECURITY REVIEW COMMISSION

SUBJECT: China's Emergent Military Aerospace and Commercial Aviation Capabilities

STATEMENT OF: Wayne A. Ulman, USAF
China Issues Manager
The National Air and Space Intelligence Center

May 20, 2010

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Wayne A. Ulman
The National Air and Space Intelligence Center, U.S. Air Force

“China’s Emergent Military Aerospace and Commercial Aviation Capabilities”
Before the U.S. – China Economic and Security Review Commission
20 May 2010

Let me begin by expressing my appreciation to the Chairman and the other distinguished members of the U.S. – China Economic and Security Review Commission. It is an honor to have the opportunity to testify here today.

Much like China as a whole, the People’s Liberation Army Air Force (PLAAF) has been undergoing transformational change over the past decade, transforming itself from a poorly equipped and trained organization into an increasingly capable fighting force. Dramatic changes have occurred in the areas of mission, personnel, training and equipment. My testimony will seek to briefly explain how these changes came about, the implications of these changes, and where things are headed for China’s air forces.

1 - To what extent have China’s air forces (to include PLAAF and PLANAF) improved over the past 10 years? Describe their strengths and weaknesses.

The capabilities of China’s air forces, particularly those of the PLAAF have improved dramatically over the course of the past decade. From an overly-large, technologically inferior force, the PLAAF is emerging as a well equipped and increasingly well trained force with some identifiable shortcomings and weaknesses. All indicators point to the continued improvement of both PLA Air Force, and PLA naval aviation over the next decade, to the point where China will have one of the world’s foremost air forces by 2020.

Transformation in the PLAAF began with a change in mission and expectations; from a force focused on territorial air defense, to a force with growing regional strike missions and capabilities, and long-term expectations of being able to perform extra-regional missions supporting PRC national objectives.

Accomplishment of this growing mission set is only possible with increasingly professional and well trained personnel. Since the late 1990s the entire PLA has become a much more professional force. By the late 1990s the PLA had been forcibly divested of most of its commercial activity and was undergoing a series of major personnel reductions. These reforms resulted in a smaller, less corrupt, more

professional PLA with a greater focus on soldering. The late 1990s also saw the creation of a professional Non Commissioned Officer (NCO) Corps in the PLA. The increasing use of complex, high-technology systems in the PLA Air Force, Navy, and Second Artillery Corps (China's missile forces), were not well suited to the high rate of personnel turn-over resulting from enlisted conscription. The professional NCO Corps has quickly grown in size and importance in these services; some 60% of PLAAF enlisted are now professional NCOs. But the relatively short time these programs have been in place means there are still shortages of the most experienced NCO.

Educationally, the PLAAF has sought to increase the number of college educated officers. According to the PLAAF, some 40% of officers have bachelor degrees, while 3% have postgraduate degrees. However, only about 30% of these bachelor degrees are from full-time university study. Formal education is a top priority for the PLAAF, but their education numbers are expected to remain below levels of USAF officer education for the foreseeable future.

Since 2000, the air forces have significantly shrunk in size while greatly increasing their number of modern aircraft. In 2000, the combined Air Force and Navy air force had over 3000 fighters, almost all of which were antiquated F-6 and F-7 variants (modeled after Soviet MiG-19 and MiG-21). Of this number, only the approximately 50 Su-27 would be considered modern fighters (4th generation). Today, total fighters have been reduced to approximately 2000 aircraft, nearly 500 of which are modern 4th generation aircraft. The PLAAF has also brought on-line critical force multiplying aircraft for Airborne Early Warning & Control (AEW&C), Electronic Warfare (EW), and Intelligence Surveillance & Reconnaissance (ISR).

Likewise, the PLAAF has made a tremendous investment in ground-based air defenses. By 2000 the PLAAF had begun modernizing their Surface to Air Missile (SAM) forces with the purchase of advanced Russian SAMs. Since then, the PLA has purchased additional units of Russian SA-20, plus China has begun the deployment of the domestically produced HQ-9, a SAM comparable to the SA-20.

Looking at China's air forces today, we see they have made tremendous progress in the past decade. Specific **strengths** include:

- Nearly 500 4th generation fighters that can be considered at a technical parity with U.S. legacy fighters.

- Internal lines of communication and redundant infrastructure for basing and C4, well suited for any Taiwan related contingency.

- One of the world's most advanced and robust air defense network.

- A limited set of well defined missions associated with a very specific set of contingencies - allowing the PLAAF to apply a greater amount of their time focused on the tasks that they believe are most important.

- A willingness to plan for, and accept, extensive losses as evidenced by history and PLA writings.

- A strong motivation to improve, as indicated by PLAAF willingness to be self-critical and increasing willingness to implement change.

China's air forces also have **weaknesses**:

- Difficulties recruiting and retaining the number of high-tech officers and enlisted troops needed to operate a technologically advanced military.

- Pilot training, experience, and the development of tactics is still not at the level of the best western militaries.

- Many of the key supporting aircraft are not yet operational, or are not yet deployed in sufficient numbers. The KJ-200 and KJ-2000 AEW&C aircraft may just be reaching operational status and have not yet been built in large numbers. Tanker aircraft are in short supply (although few of the missions directly related to a Taiwan military contingency require extensive tanker support). The PLA does not yet have sufficient numbers of large transport aircraft for missions such as strategic lift, aerial refueling, and AEW&C.

- Lack of PLA corporate experience with modern combat. Although they have studied modern combat extensively, the most recent combat for the PLA was the Sino-Vietnam conflict in 1979, a conflict which the PLAAF played almost no part. This lack of live experience presents difficulties in validating tactics, procedures and concepts and can lead to misjudgments.

- The PLAAF and other PLA services appear proficient in conducting detailed planning, but there is significant uncertainty about their ability to react effectively to a very fluid, dynamic military situation.

- Continued PLA reliance on a fairly inflexible C2 structure, and PLAAF reliance on a ground-based command architecture (which may only be a weakness if it can be exploited).

2 - Describe the PLAAF's missions.

The PLAAF's primary mission has historically been defense of the homeland and providing support to PLA ground forces. Historically, PLAAF equipment and training were consistent with these missions.

Over the past two decades, the PLA has undergone a rapid evolution in their overall doctrine. Based on world events and PLA analysis of U.S. military operations, in 1993 the PLA modified their highest level of doctrine, the Military-Strategic Guidelines. At the time, the PLA was instructed to prepare to fight "Local Wars Under High-Tech Conditions," in essence to prepare the PLA to fight the type of high-tech war conducted by the U.S. military in the 1991 Persian Gulf War. These guidelines were further modified beginning in 2002 when President Hu first proposed modifying them to reflect the importance of information, space, and the electromagnetic spectrum. This resulted in the guidelines being re-issued as "Local Wars Under Informationalized Conditions." In essence, the PLA now sought to improve their use of information, deny enemy use of information, and to control the electromagnetic spectrum. Efforts to improve PLA use of information include improving all aspects of ISR, increasing capabilities for cyber operations, and improved joint communications. Efforts to deny enemy information include electronic warfare, counter-space, denial & deception, and secure communications.

The final major driver for the development of PLA forces and doctrine was President Hu's desire for the PLA to begin preparations for non-traditional security operations and operations beyond Taiwan. This desire was articulated in 2004 by Hu as "The Historic Missions of Our Military in the New Period of the New Century." In the future, the PLA will increasingly be called upon to protect and support PRC interests world-wide.

In terms of strategy, the PLAAF did not have its own strategy until 2004 when "Integrated Air and Space Operations, Simultaneous Offensive and Defensive Operations" was announced. This strategy had been under development for quite some time. To put this into perspective, the PLA Navy has had their service-specific strategy, known as "Offshore Active Defense" since 1996.

In dissecting the PLAAF strategy, "Simultaneous Offensive and Defensive Operations" mandates the PLAAF prepare for various offensive missions in addition to maintaining their long-standing defensive missions. The PLAAF is increasingly equipped with multi-role fighters and now trains for both offensive and defensive operations.

Of greater uncertainty is the phrase “Integrated Air and Space Operations.” PLAAF writings seem to indicate a desire by the PLAAF to integrate the use of space into their air operations. PLAAF writings indicate a view that they will naturally be users of space based capabilities; however it is uncertain what role the PLAAF sees for itself in managing space capabilities. Space and counter-space capabilities are still relatively new to the PLA, and a variety of writings would indicate that there remains uncertainty about who will ultimately manage operate space and counter-space capabilities.

3 - Have these missions changed in recent years? If so, are these changes reflected in similar organizational, material, and doctrinal changes?

The basic missions of the PLAAF have changed rapidly over the past decade and are still in the process of being redefined. As stated, the PLAAF has taken on an increasing number of offensive missions in addition to their traditional defensive missions. These missions require the PLAAF to operate at greater distances from home bases and increasingly require overwater operations. As the PLA prepares for combat in the information and electromagnetic domains, the PLAAF is undergoing a transformation to an informationalized force with improved sensors, ISR, communications, and electronic warfare capabilities.

The full set of missions associated with “New Historic Missions” has not completely evolved. The PLA has been given direction to prepare for a wide range of non-traditional missions (e.g., protecting PRC economic interests, preventing hegemony, protecting sea lines of communication, etc.). The service-specific details of these missions do not yet seem to be fully defined, and the resulting equipment requirements may also not yet be fully defined. 2011 will begin a new Five-Year Plan, and the equipment requirements supporting New Historic Missions will likely begin to be addressed with this plan. PLAAF documents have referred to this ongoing transformation as an evolution from “traditional” air force (with primarily defensive missions) into a “strategic” air force (with global missions such as ISR, strike and lift).

4 - Is the PLAAF currently capable of carrying out its assigned missions?

The ability of the PLAAF to execute its assigned missions is largely dependent on the scenario and adversary, and should be examined in the context of overall military campaigns. The PLA has a construct of both single-service and joint-service campaigns designed for implementation during major military conflict. The PLA discusses several different types of campaigns in their doctrinal writings. These

campaigns largely reflect doctrinal planning for potential Taiwan military contingencies, including the potential for U.S. military intervention.

Joint Anti-Air Raid Campaign - This campaign is designed as the cornerstone to countering U.S. military intervention and draws heavily on PLA observations of U.S. war fighting tendencies as demonstrated in numerous conflicts including the 1991 Gulf War and 1999 OPERATION ALLIED FORCE. The Joint Anti-Air Raid Campaign has both defensive and offensive components.

Defensively, the PLAAF is responsible for air defense of the mainland, including Beijing and other critical civil and military targets. This mission is accomplished primarily using their SAM and fighter forces, but other PLA services contribute to the effort with electronic warfare, civil air defense, denial & deception, and other measures aimed at resisting precision strike operations.

The offensive component involves attacking adversary airpower at its source by striking airbases, carrier strike groups and support elements such as logistics, communications and ISR (including space assets). PLAAF missions include conducting strike operations, primarily in conjunction with the 2nd Artillery Corps' conventional cruise missile and ballistic missile forces. Against a base such as Kadena, the missile forces would likely conduct the initial strike - targeting air defenses, airfields and C4 nodes. This would be followed closely by PLAAF anti-radiation UAVs, jamming aircraft and strike aircraft armed with precision guided weapons. The goal is to reduce the effectiveness of enemy strike forces by shutting down air operations. Against carrier strike groups, the PLAAF has primarily a role of supporting and protecting PLA Navy forces. The actual strikes against naval targets would likely be left to the PLA Navy using aircraft, surface ships and submarines - all armed with anti-ship cruise missiles.

The PLAAF is well equipped and relatively well trained to execute air defense mission. Offensively, the PLAAF and 2nd Artillery Corps are equipped to execute strike operations against bases such as Kadena - including multi-role fighters with precision strike weapons and SRBMs and MRBMs with tailored warheads. The success of these operations would depend on many variables, including the ability of the PLA to effectively coordinate operations between services, the preparations and actions of any adversary, and the actual situation at the time of combat. Less certain is the PLAAF's ability to operate effectively in a dynamic combat environment or after the initial stages of a conflict. Their ability to sustain operations over an extended period is also an uncertainty. The PLAAF and 2nd Artillery currently have only limited capabilities to threaten U.S. facilities on Guam, due to the distance from mainland China.

However, the PLA appears to be working toward longer range strike systems to rectify this shortcoming. For example, PLAAF is developing a longer range version of their B-6 bomber, which will be armed with long-range land-attack cruise missiles. When operational, this system will have the capability to strike targets on Guam.

Joint Fire Strike Campaign - This campaign is designed against targets either on the island of Taiwan, or on the Taiwan off-shore islands. The 2nd Artillery Corps and the PLAAF would work jointly to conduct these operations, with the missile forces likely comprising the initial strike, followed by PLAAF forces. The opening focus would likely be against air and air defense assets in order to achieve air superiority. Critical to the success of this effort would also be electronic warfare and cyber operations aimed at gaining superiority in the information and electromagnetic domains.

The PLAAF is well equipped to conduct strike operations against Taiwan and the Taiwan off-shore islands. Much of the new equipment added to PLAAF inventories over the past decade has been strike capable aircraft. In addition, the 2nd Artillery is equipped with well over 1,000 short range ballistic missiles for use against Taiwan. The PLAAF and 2nd Artillery are well equipped and trained to conduct initial jointly planned strikes. Uncertainty remains as to their ability to react dynamically and to sustain operations over an extended period.

Joint Blockade Campaign - One of the doctrinally defined military options developed for use against Taiwan is a joint air and naval blockade of Taiwan. Among PLAAF missions would be enforcing the air blockade in conjunction with missile forces from the 2nd Artillery Corps. The PLAAF would also provide support to the PLA Navy as they conduct the naval portion of the Joint Blockade. PLA doctrine on Joint Blockade indicates that this operation would be planned as a much more destructive operation than a simple quarantine or embargo. Enforcing the joint blockade would likely involve kinetic strikes against at least ports, airfields and air-defense assets.

The PLAAF is well equipped to conduct both the air blockade, and to support PLA Navy in the naval blockade. Uncertainties involve the ability of the PLAAF to enforce a blockade over an extended period of time, and uncertainty over the effectiveness of PLAAF and PLA Navy joint operations.

Airborne Landing Campaign - Within the PLA, airborne forces belong to the PLAAF. As part of any larger campaign to land forces on the island of Taiwan or against off-shore islands, the PLAAF would

have the mission of conducting airborne landing operations. Airborne forces do train regularly, but an overall shortage of heavy-lift transport within the PLAAF would likely limit the scale of any airborne landing operations.

5 - Describe recent developments in PLAAF training. How do China's military aviators compare to those of other militaries?

Due to lack of modern aircraft, the PLAAF was unable to develop and train with modern air combat tactics until the mid-1990s when the first Su-27 entered the inventory. It wasn't until after 2000 that a significant number of units received modern fighters.

Since that time, the PLAAF has worked diligently at improving the caliber of their air crews. Compared to other air forces world-wide, the PLAAF would be considered professional and well trained. In terms of flight hours, safety standards, night-time flying, debriefing, and overall training subjects, the PLAAF is likely approaching NATO standards. PLAAF pilots regularly fly 100-200 hours per year depending on aircraft variant. Transport and bomber pilots are typically at the upper end of this range, as are the pilots for the most modern fighters. Pilots in units equipped with older aircraft are typically near the lower end of this range. In addition, the PLAAF has worked to increase the amount of simulator training time available to all pilots.

PLAAF pilots train more extensively for defensive operations and should be considered more proficient in these areas. Offensive strike training seems to be trained less regularly and is probably rather inflexible in execution.

Since 2007, the entire PLA has placed an emphasis on joint training and on training to fight under a Complex Electromagnetic Environment (CEME). The PLA believes that any future combat environment will be conducted in a cluttered electromagnetic environment containing emissions from commercial and military systems, in addition to significant amounts of electronic warfare jamming. The PLA is preparing units to operate in this electromagnetically dense environment. As a result, some level of adversary electronic warfare and cyber operations are represented in nearly all training and exercise events. Within the PLAAF, electronic warfare and jamming are important elements in most tactical training.

In 2009, the PLA implemented a new revision of their Outline of Military Training and Evaluation (OMTE) - a regulation guiding how training will be organized, implemented and evaluated. Emphasized in this OMTE were joint training, training in CEME, and improved realism in training, including increased use of opposition forces (known as Blue Force). Within the PLAAF, most tactical training and exercises now seem to contain some level of opposition force participation. Also appearing in this OMTE were new requirements for training in anti-terrorism operations, international peacekeeping and military operations other than war.

Finally, the PLAAF is increasingly seeking opportunities to train with pilots from other countries - particularly with air forces that also train with the U.S. Air Force. The PLA has been conducting annual training exercises with the Russian military since 2005, but the last two years have seen an increase in PLAAF engagement with western air forces. This joint training offers the opportunity to test equipment, procedures and pilot skills with dissimilar air forces. It can also help to mitigate the lack of actual combat experience over the past three decades.

6 - To what extent are PLAAF improvements based on newer and more capable platforms and hardware? Are these domestically built or purchased from foreign sources?

Within the PLAAF, the introduction of modern systems began in the early-1990s, with the purchase of Su-27 fighters and SA-10 SAMs from Russia. At that time, China's aviation and aerospace industries were not yet able to produce modern systems of this class. By the mid-1990s, China signed a licensed production agreement with Russia for production of 200 Su-27. The domestic F-10 was under development, but was not yet ready for production. Although the PLAAF was aware of their need to modernize the force, national priorities were focused on economic modernization, so military modernization progressed at a measured pace.

In 1999, the combination of independence-minded comments by Taiwan President Lee Teng Hui, coupled with U.S./NATO military involvement in Kosovo (without a UN mandate), quickly raised concerns in Beijing. The PRC's leadership perceived that Taiwan was moving more rapidly toward independence, while the U.S. was demonstrating an increasing willingness to become militarily involved in the internal affairs of other countries. The leadership in Beijing decided that an increased priority was needed in order to prepare for possible military contingencies for Taiwan, and for the likelihood of U.S. intervention.

The result over the next few years was an increase in arms purchases from Russia. For the PLAAF, this included the procurement of Su-30MKK multi-role fighters, SA-20 advanced SAMs, and additional Su-27. For the PLA Navy, this included purchase of advanced destroyers and Kilo submarines. Despite these large purchases of entire systems, the PRC retained their long-term goal of becoming independent in the development and production of arms. So while they bought arms from Russia, they also increased the emphasis on domestically produced weapon systems such as the F-10 fighter and short range ballistic missiles.

Over the past ten years, the PRC has continued to purchase weapon systems, sub-systems, technology and expertise from Russia and elsewhere. However, the trend has moved away from the purchase of entire systems, and a movement toward purchasing sub-systems, technology and expertise. Meanwhile, the PRC defense industries have demonstrated an increasing ability to develop and produce advanced weapon systems. The F-10 is currently in production, upgraded versions of F-10 and F-11 (Chinese produced version of Su-27) have both been developed, and a next-generation fighter (referred to as the XXJ) should be operational around 2018.

Because of the complex nature of modern weapons, coupled with the global market for arms, technology and components, it may never be practical (or desirable) for the PRC to be fully independent in producing all military systems. China continues to lag world standards in some areas of military technology, but is near world-class in many others.

Improvements in PLA capabilities over the past decade are undeniably tied to improvements in weapon systems over that time span. The PLA can now boast 4th generation fighters equipped with modern jammers, communications systems, and weapons. However, improvements in military capabilities should also be credited to advances in other key areas. Since the late 1990s the PLA has implemented new doctrine and strategies more suitable for 21st century warfare. They have placed an increased emphasis on training and operationalizing their military forces. Great strides have been made in streamlining and professionalizing the PLA. Lastly, the PLA has developed a clear sense of mission and purpose, all contributing to a greatly improved PLA military capability when compared to a decade ago.

7 - Describe and evaluate the PLAAF's attempts to establish "strategic projection" capabilities, as stated in China's 2006 and 2008 white papers.

The development of a strategic projection capability is an emphasis for the PLAAF. PLAAF offensive missions in the Joint Anti-Air Raid Campaign demand an ability to hold at-risk targets within the region, including airbases and support facilities. Currently the PLAAF cannot effectively strike out to Guam. However, systems are under development which should place Guam at risk by the middle of this decade. These systems should give the PLAAF a capability to strike targets throughout the entire western Pacific and South China Sea.

8 – Do China’s Second Artillery forces – especially its conventional short-range and medium-range ballistic missile forces – obviate the need for traditional air platforms?

The 2nd Artillery Corps is an important component to the PLA’s strategy for neutralizing adversary air power, and for conducting offensive strike operations. But this capability effectively augments traditional airpower, it does not replace it. So while conventional missile forces do provide some distinct advantages over airpower, including excellent ability to penetrate air defenses, short time of flight, and reduced training and maintenance (compared to combat aircraft), they do not offer the level of flexibility provided by combat airpower.

9 – What future developments can we expect to see in China’s aerospace capabilities?

The PLAAF is working to develop effective counter-stealth capabilities. For more than a decade, China has been working on technologies, systems, and procedures to detect, track and engage stealth aircraft and cruise missiles. They are developing a network-centric kill chain to fuse data from an extensive and diverse sensor network. They are also working to reduce the signature of current aircraft designs and on developing a low-observable fighter. As the PLAAF gains access to reduced signature systems, it will allow the development of tactics, training and procedures for use against low-observable threat systems.

The PLA is working on a very comprehensive approach to information superiority. They seek to integrate electronic warfare, cyber operations, PSYOPS, denial & deception, and kinetic attack to defeat adversary information systems. The PLA seem intent on integrating electronic warfare with cyber operations. Chinese efforts to develop counter-space capabilities are also an important element of this effort to achieve information superiority by denying or degrading adversary ISR, C4, and navigational

capabilities. Overall, the PLA considers itself at a fairly early stage of informationalization, with a goal of achieving a fully informationalized PLA by 2050.

The PLA is also expected to continue development of anti-access (what China would refer to as “counter-intervention”) capabilities. Long-range aerodynamic systems, longer range conventional ballistic missiles, and anti-ship ballistic missiles are all under development. As time progresses the ISR, the C4, and the procedures will be developed and refined – giving the PLA the ability to hold at risk all classes of targets in the western Pacific and South China Sea.